MODEL FOR IMPROVING THE SOFTWARE FOR THE DEVELOPMENT OF PROFESSIONAL COMPETENCIES OF FUTURE ROAD ENGINEERS

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Abstract. This article proposes a model to improve educational software for developing professional competencies in future road engineers. The model includes modular content, interactive simulations, industry-standard integration, and collaboration tools. It supports competency-based learning and real-world problem-solving. With phased implementation and educator training, the model aims to enhance both technical and soft skills, preparing students for modern road engineering challenges.

Keywords: road engineering, software model, competency development, interactive learning, assessment.

Introduction. In today's rapidly evolving digital landscape, the integration of advanced software technologies in engineering education has become not only desirable but essential. Especially in the field of road engineering, where precision, innovation, and sustainability are critical, the development of professional competencies among future engineers must keep pace with modern industry standards. Therefore, it is crucial to propose and implement a model for improving software that enhances professional competency development. This article aims to present a structured model for such software, with a focus on fostering the practical, analytical, and collaborative skills of future road engineers.

To begin with, the complexity of modern road construction projects necessitates a strong foundation in technical knowledge and practical application. Traditional methods of education often fall short in simulating real-world conditions, thus making it difficult for students to gain hands-on experience. In contrast, software-based learning environments provide opportunities to model real-world engineering problems, analyze solutions, and test various scenarios. Consequently, integrating a purpose-built educational software model into road engineering curricula can significantly enhance the learning outcomes. Moreover, professional competencies such as teamwork, decision-making, and project management are best developed through interactive and problem-solving environments. This further justifies the integration of software systems designed to address these learning goals in a simulated yet realistic setting [2, 35-39].

The proposed model is built upon several key components that align with educational and industry needs. These components are described below:

Firstly, the software must adopt a modular structure, wherein each module corresponds to a specific competency. For example, one module may focus on road design and geometric modeling, while another addresses traffic flow simulation or materials testing. This allows for gradual progression, enabling students to build knowledge step by step. Secondly, it is important that the model includes interactive features such as 3D modeling tools, dynamic simulations, and real-time feedback. Through these tools, students can visualize the effects of design choices on road performance and safety, thereby deepening their understanding.Another vital aspect is ensuring the software is aligned with national and international road engineering standards, such as AASHTO or local regulatory frameworks. This not only prepares students for professional work but also fosters a deeper appreciation of compliance and quality assurance in construction practices. Equally important are built-in tools for tracking student performance. These include quizzes, simulation scoring, peer reviews, and instructor dashboards. Such mechanisms not only support self-assessment but also help educators identify areas for improvement and tailor instruction accordingly. Furthermore, as teamwork is essential in engineering, the software must support collaborative features. These may include virtual group workspaces, task management boards, and communication channels. As a result, students develop not only technical skills but also soft skills essential for project execution [3, 233-242].

Implementing this software model requires a phased strategy. Initially, it is advisable to conduct a needs assessment to determine specific competency gaps among students. Following this, pilot testing with a small group can be conducted to gather feedback and refine features. Subsequently, the software can be gradually introduced into the broader curriculum. Training educators to effectively use the software is also essential. Workshops, manuals, and support systems must be provided to ensure smooth adoption. Additionally, partnerships with industry stakeholders can help in maintaining software relevance and updating content as per technological advancements. Undoubtedly, the implementation of such a model brings numerous benefits. Firstly, students will gain a more comprehensive understanding of theoretical concepts through their practical application in software environments. Secondly, they will be better prepared for real-world engineering tasks, having already encountered similar challenges virtually. Furthermore, the software supports a competency-based education approach, which is increasingly being adopted globally. By enabling self-paced learning and continuous assessment, it contributes to personalized education, catering to diverse learning styles and paces. Lastly, this approach fosters a culture of innovation and problem-solving, as students are encouraged to experiment with various scenarios and solutions.

Conclusion. In conclusion, the development of a specialized software model aimed at enhancing the professional competencies of future road engineers is both necessary and timely. With the right combination of modular design, interactivity, industry alignment, and collaborative tools, such software can transform road engineering education. Moving forward, educational institutions, software developers, and industry experts must collaborate to bring this model to life, ensuring that the next generation of road engineers is fully equipped to meet the demands of modern infrastructure development.

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